FDV-PE0

Electrical Actuation with Local Reset and Pressure reducing Deluge Valve

INSTALLATION OPERATION & MAINTENANCE MANUAL

FIRE PROTECTION

RAPHAEL VALVES INDUSTRIES

RAPHAEL FP

Description



Raphael's FDV valve, equipped with Electrical actuated control trim. The FDV valve installed, have a range of optional materials and coating to fulfill operation condition needed, but the system's function principle stays unchanged: in fire situation, an electrical fume/heat detection system trips the valve's control trim by energizing its solenoid. Consequently, pressurized water trapped in the FDV' control chamber are drained, the valve opens, and water admits into the spray nozzles pipeline. This system is capable to reduce the upstream pressure to a set downstream pressure and maintain it in a steady level. The system responses to any downstream pressure changes caused by consumption flow rate changes and keeps a stable set pressure. The trim is equipped with a PSA – a component that serves as a latching devise and enables the local reset of the system. This system is suitable for water spray pipelines with open nozzles

Operation (reference - figure 1)

SET position:

Water is supplied by the trim supply valve (7), “Y” strainer (6), check valve (5), flows through the needle valve (9), and fills the FDV’s control chamber. Pressurized water in the valve’s control chamber is trapped by the check-valve (5), by the HAV-2 actuator (15) and by the closed emergency valve (8), maintaining the deluge valve in closed position. In case of minor leakage from the FDV’s control chamber piping, the PSA (2) moves to its ‘compensation state’, ensuring that the HAV-2 control chamber is pressurized, keeping the device close.

FIRE situation:

When one or more of the electric fume/heat sensors is tripped, it transfers a signal to the main control board that in turn, energizes the 2-way solenoid (9). Getting tripped, this solenoid drains the HAV-2 (15) control chamber through the PSA’s (2) upper manifold to the atmosphere, and the actuator opens. Consequently, the FDV deluge valve opens and water flow into the sprinklers pipeline.
The drop of pressure in the PSA’s upper manifold, causes the ball to move to its upper seal seat, preventing upstream flow from entering the deluge valve control chamber. By that, the PSA latches the HAV-2 actuator open and by that, latches the FDV valve in its open position.
Opening the MEU (8) door and pulling down the ball valve’s handle, bypasses all terms, drains the FDV control chamber and opens the valve immediately.

RESET position.

The first step to prepare the valve’s trim for the Reset procedure is by be

de-energizing the solenoid (at the main control board).

Then, the PSA (2) push-button should be pressed down. By that, the device internal ball is pushed from its seat, enabling the upstream to flow through and fill the HAV-2 (15) actuator’s control chamber. Consequently, the HAV-2 and the FDV valve closes, and water spray stops.

It is recommended to drain the sprinklers pipeline by opening the FDV’s downstream drain port (15) or operating the MADV (12) drain valve.

Parts list (reference figure1)

1. – Downstream pressure gauge
2. – PSA-Pressure Surge Arrestor
3. – Pressure switch conn. ½" NPT (optional)
4. – Alarm test valve (3 way)
5. – Check valve
6. – "Y" Strainer
7. – Trim Pressure Supply Valve
8. – EMU Emergency valve (2 way)
9. – Needle valve
10. – Control chamber pressure gauge
11. – Upstream drain port (plugged)
12. – MADV drain valve
13. – Downstream drain valve
14. – Water Motor Alarm conn. ½" NPT (optional).
15. – HAV-2 2-way actuator
16. – PRPV Pressure reducing pilot
17. – Solenoid (2 way)

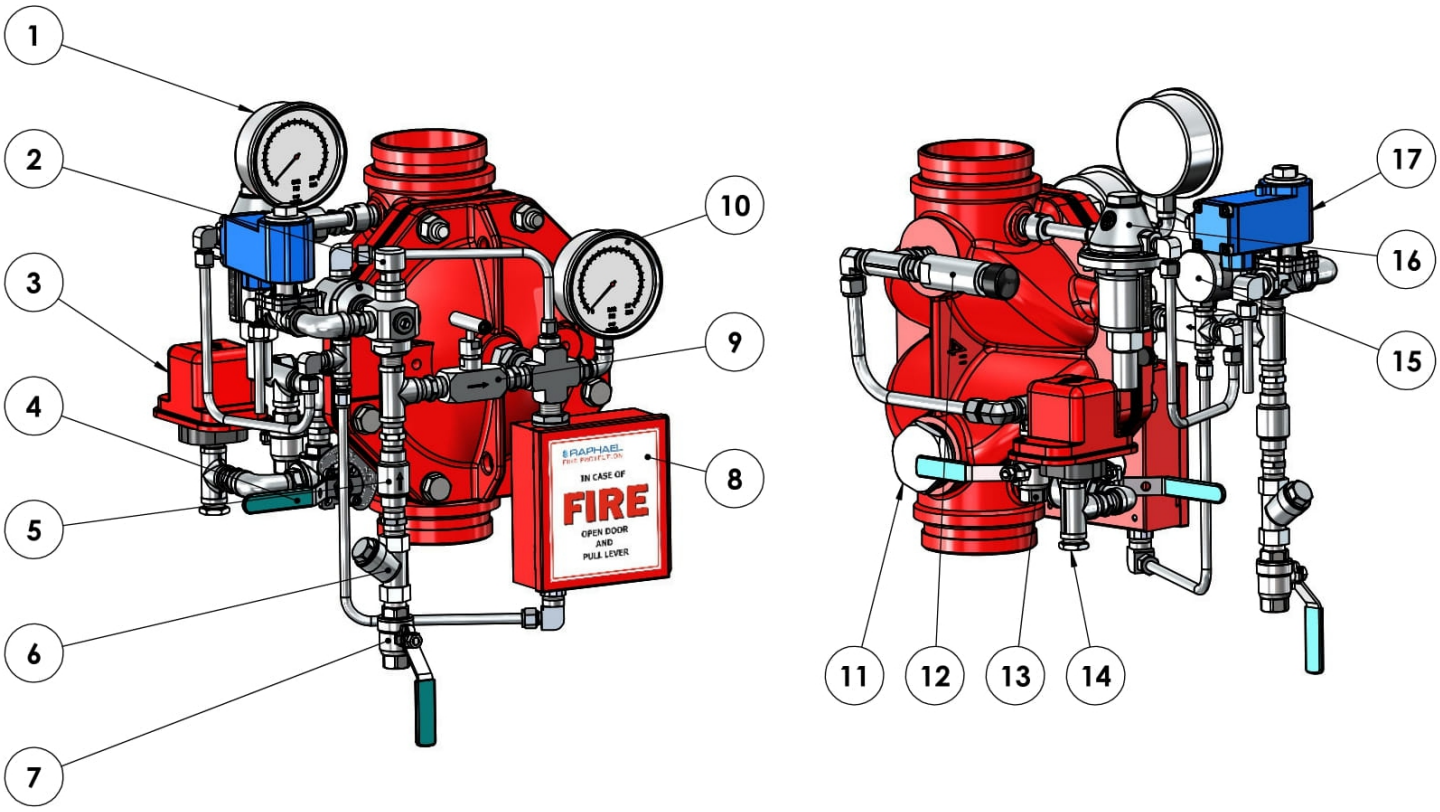


Fig 1

Installation (reference - figure 2)

1. This system is supplied pre-assembled and factory pre-adjusted. Any change carried out This system is supplied pre-assembled and factory pre-adjusted, including the PRPV pilot's set pressure and needle valve position. Any change carried out at the system's trim components adjustments or order, pipe and tubes length or ports for axillary connection sizes, will affect the system operation and therefore prohibited.

2. The system cannot be installed at a location where it might be subjected to freezing temperatures.

3. Sufficient room around the system location should be kept, to enable assembly/disassembly and maintenance work.

4. It should be considered that water will be drained during regular maintenance on a routine basis, during periodical tests procedures and when operating in fire situations. Therefore, a drainage plan should be considered.

5. The system described is to be mounted vertically only. Systems with identical operation but for horizontal installation are marked with a prefix "H", e.g. HFDV-PE0.

6. It is essential that the PSA's installation orientation will be vertical only, regardless of the deluge valve orientation.

7. The downstream pipe connected to the FDV valve at a horizontal mount needs to be supported firmly to prevent the pipeline's weight from being loaded on the system's valve.
8. Any use of pipe/thread reduction-fittings installed at open ports designated for axillary components, (like water motor alarm, pressure switch, trim pressure supply, FDV valve's drains, solenoid drainpipe, etc.), is prohibited.

9. All connections to water supply, alarms etc. should be done in accordance with figure 2:
   (CH) – Trim pressure supply connection (1/2" NPT)
   (S2) – Water motor alarm connection (connect ½" to ¾" NPT nipple)
   (PR) – Pressure switch connection – optional (1/2" NPT)

(CV) – Solenoid valve drain tube (3/8” tube)
(PSA) – Downstream drain valve (1/2” NPT)

10. The FDV valve should be installed with the flow arrow marked on the valve’s body, in the proper direction

11. It is emphasized that the valve should not be exposed to high hydraulic test pressures used for detecting pipeline leaks. The mechanical valve at its upstream must be closed before the test.

12. Before performing the high-pressure leak test, make sure that the butterfly valve or the OS&Y valve upstream of the deluge valve is closed, in order to prevent damage to the diaphragms in the valve and in the trim components.

13. Make sure that the gong connected to its designated outlet is supported so that its weight, along with the weight of the piping attached to it, is not applied to the valve trim.

Installation parts list

(reference - figure 2)

TS – Trim Supply

ST – Strainer

AT – Alarm Test valve

GC – Gong Connection

DDV – Downstream Drain Valve

HAV2 – Hydraulic actuator 2 way

PS – Pressure Switch

OR – Orifice

S2 – 2-way Solenoid

PSA – Pressure Supply Arrestor

MD – Manual Automatic Drain Valve

PR – PRPV – Pressure Reducing Pilot Valve

ASK – Air Supply Kit

ES – Electric Sensors

DPG – Downstream Pressure Gauge

CPG – Control chamber Pressure Gauge

UBV – Upstream Butterfly Valve

DBV – Downstream Butterfly Valve

DL – Deluge valve

*** Optional**

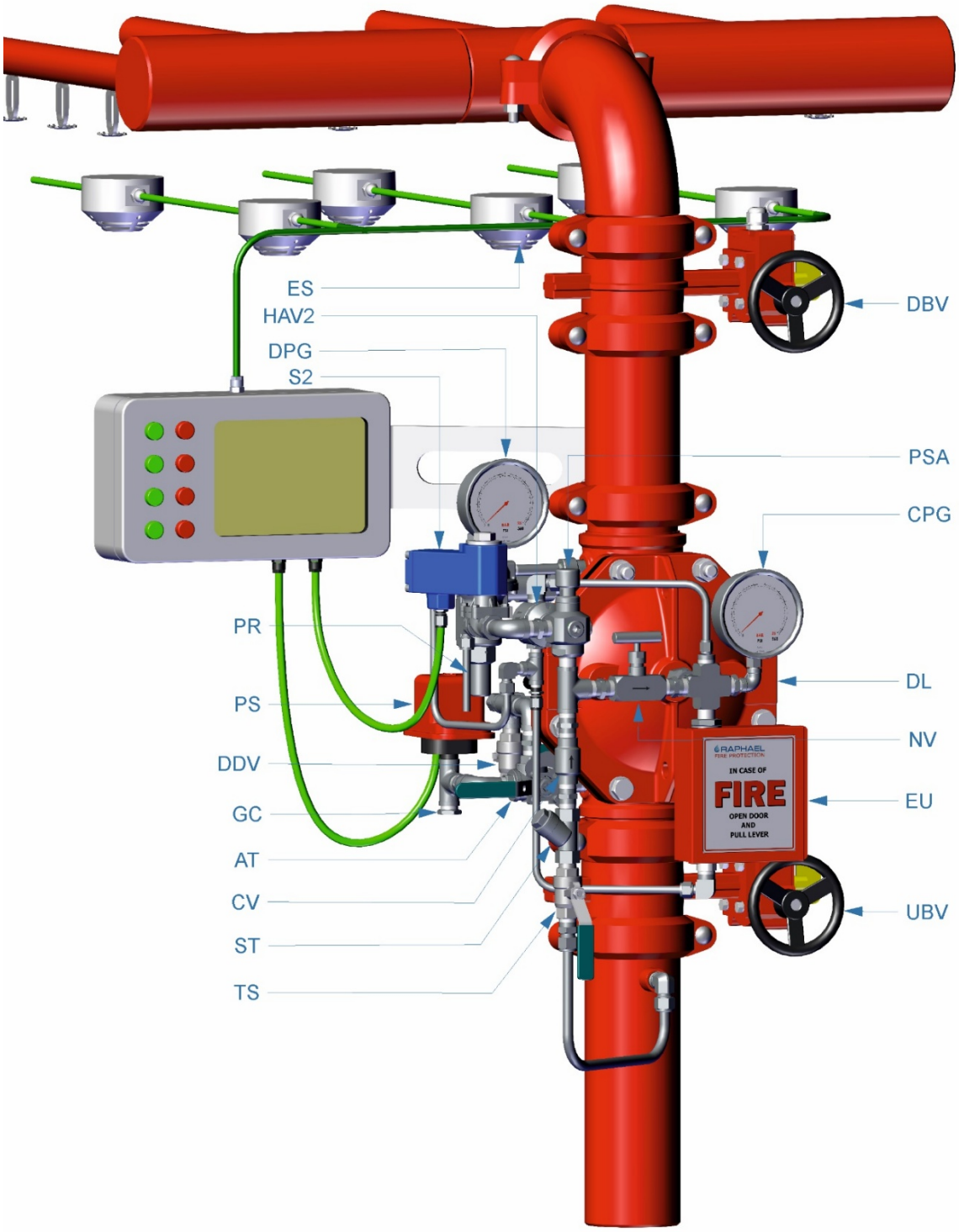


Figure 2

Commissioning the system - phase 1.

Filling and pressurizing the system.

The procedure described should be carried out after system installation completion and a comprehensive inspection.

(Reference drawing - figure 2)

1. Make sure the upstream and downstream butterfly valves (UBV & DBV) are fully closed.

2. Make sure the solenoid (S2) is de-energized.

3. Make sure the trim pressure supply ball valve (TS) is Closed.

4. Make sure that MEU door (EU) is fully closed. If open – turn valve's lever upwards and close the door.

5. Make sure the FDV's downstream drain valve (DDV) is open and the upstream drain valve if equipped, is closed.

6. Open the trim pressure supply valve (TS).

7. Press the PSA's push-button (PSA) and by that, pressure the HAV-2 control chamber. When the actuator closes, the FDV's control chamber pressurizes as well and the deluge valve close.

8. Open gradually the upstream butterfly valve (UBV) and make sure the downstream drain valve (DDV) is not dripping. If a dripping is observed, it might be because of an FDV valve sealing issue. (see Troubleshooting chapter in FDV's basic valves datasheet & IOM bulletin)

9. Turn On the electric detection system.

The system is ready for the fire situation simulation.

Commissioning the system - phase 2.

Fire Situation Simulation

The procedure described, should be carried out after the system was pressurized and a comprehensive leakage inspection was commissioned.

Energizing the solenoid can simulate a fire situation and cause the system to response by opening the FDV deluge valve.

NOTICE:
Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.
Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personnel and the close central fire station must be reported.

(Reference drawing - figure 2)

1. Energize the solenoid through the main control panel. Trapped water will drain out from the FDV's control chamber.

2. Fully open the downstream drain valve (DDV).

3. Observe the pressure gauge installed on the pressure reducing pilot valve (DPG). Downstream pressure correction if needed, is performed by this method:
   - to increase the pressure – turn the pilot's adjusting screw clockwise
   - to decrease the pressure – turn the pilot's adjusting screw anticlockwise.

4. Assure the functionality of the pressure-reducing pilot and the downstream pressure steadiness: While the FDV valve is open, turn the downstream drain valve handle and close it gradually. Assure that the pressure reaches SET again. Then, open this ball valve halfway. Observe the downstream gauge reading - it should reach again to SET pressure.

5. If ok, fully close the downstream drain valve.

6. Turn off the solenoid valve through the main control board. When done, push the PSA's push bottom (PSA): the FDV deluge valve should close.

7. Close the upstream butterfly valve (UBV) and drain the residual upstream pressure by opening the upstream drain valve if equipped.

8. Observe the FDV control pressure gauge (CPG): it should show the set pressure. This indicates that all the check valves (at the PSA & CV) function properly and that the FDV valve is kept close although upstream pressure was drained.

System is ready for Resetting & placing in service

Commissioning the system - phase 3.

Resetting & placing in service

The procedure described, should be carried out after any periodic operational test, simulated or real fire situation.

After a real fire situation, make sure that the SOV is closed by de-energizing its coil (through the FP main control board). (Reference drawing - figure 2)

1. Close the trim pressure supply valve (TS).

2. Close the upstream butterfly valve (UBV)

3. Make sure that the solenoid valve (S2) is De-energized.

4. Clean the “Y” strainer (ST) screen and re-assemble.

5. Open the trim pressure supply valve (TS).

6. Press the PSA’s push-button (PSA) until the control chamber pressure gauge (CPG)) shows the inlet pressure value. FDV’s control chamber is pressurized, and the valve is close.

7. Open the upstream and downstream butterfly valves.

8. Open downstream drain valve (DDV). Drain the pipeline and close.

System is in SET state and placed in service.

Maintenance

Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.

Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personal and the close central fire station must be notified.

Maintenance and inspection procedures follow the NFPA 25 instructions for deluge valves.

Daily Inspection

Make sure that the deluge valve's heating system (If equipped), functions correctly and that the Fire protection valve surrounding temperature is 4°C min.

Monthly Inspection

1. Observe the FDV valve for external damage: observe the piping and hose connections for leakage or damage.
2. Verify that the upstream butterfly valve (UBV) and the Trim pressure supply valve (TS) are in fully open position.
   Downstream drain valve (DDV) and upstream drain valve (if equipped) are fully close.
3. Press the PSA push-button (PSA) for about 5-10 sec. to assure FDV valve control chamber is pressurized and then, release.
4. Push the MADV (14 **figure 1**) and make sure that after emptying the condensing water, the drain flow/dripping stops. If a constant leakage is observed, it might indicate a deluge valve sealing problem.
5. Move the 3-way SET/TEST valve to TEST. The acoustic alarm should sound, and alarm pressure switch (PS) should transmit a signal to the main control board.

Annual test procedure

1. Conduct the monthly inspection procedure.

2. Perform the procedure described in chapter - **Commissioning the system - phase 2. -** Fire Situation Simulation. Check and confirm the system's proper operation.

3. Follow the procedure described in chapter - **Commissioning the system - phase 3**. - Resetting & placing in service. Check and confirm the system's proper operation.

Every 5 years inspection procedure

This major inspection and maintenance procedure includes the removal of the trim, the dismantling of the FDV's valve cover and a performance of a comprehensive internal part examination. Then, the relevant trim accessories should be maintained, referring their maintenance instruction. After the completion, the Annual maintenance procedure is to be conducted.

1. Close the upstream butterfly valve (UBV) and the trim pressure supply valve (TS).

2. Open the drain valves (DDV) and the upstream drain valve (if equipped). Drain the FDV's control chamber using the EMU Emergency valve (EU).

3. Turn off or disconnect all relevant electrical circuits.

4. Release all relevant tubes fitting nuts and the central union pipe connection (if equipped) at valves cover center.

5. Remove the disassembled trim.

6. Remove all the FDV's cover bolts. The cover will hang on its studs. Release both nuts and remove the cover carefully.

7. Observer the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or pealing).

8. Worn or damaged parts should be replaced. Consult Raphael's local representative or the service department for any maintenance issue or part replacement issue.

9. Replace the Diaphragm. The identification tongue should point to the valve's stamped size (diameter in inch) side.

10. Reinstall the valve's cover: use the Anti-seize paste tube supplied in the maintenance kit for bolts and nuts lubrication. Tight them in accordance with "Bolt's torque moments table".

11. Reinstall the trim carefully: avoid causing twists or dents on bent tubes and do not overtight the compression fitting's nuts.
12. When the system is fully reassembled, perform the "**Commissioning the system - phase 1** - Filling and pressurizing the system" procedure.

13. Perform the "**Annual maintenance procedure**".

Bolt's Torque Moments Table

Valve size	1.5"	2"	2.5"	3"	4"	6"	8"	10"
Torque lb/ft	22	29	36	54	65	72	87	1DBV

Equivalent pipe length for FDV deluge valves

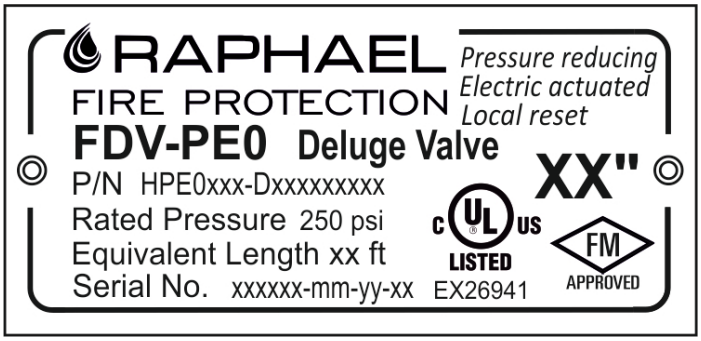
Valve size	Equivalent length value ft (m)
1.5"	11 (3.6)
2"	24 (7.3)
2.5"	25 (7.6)
3"	28 (8.5)
4"	31 (9.4)
6"	46 (NV))
8"	72 (21.9)
10"	117 (35.6)

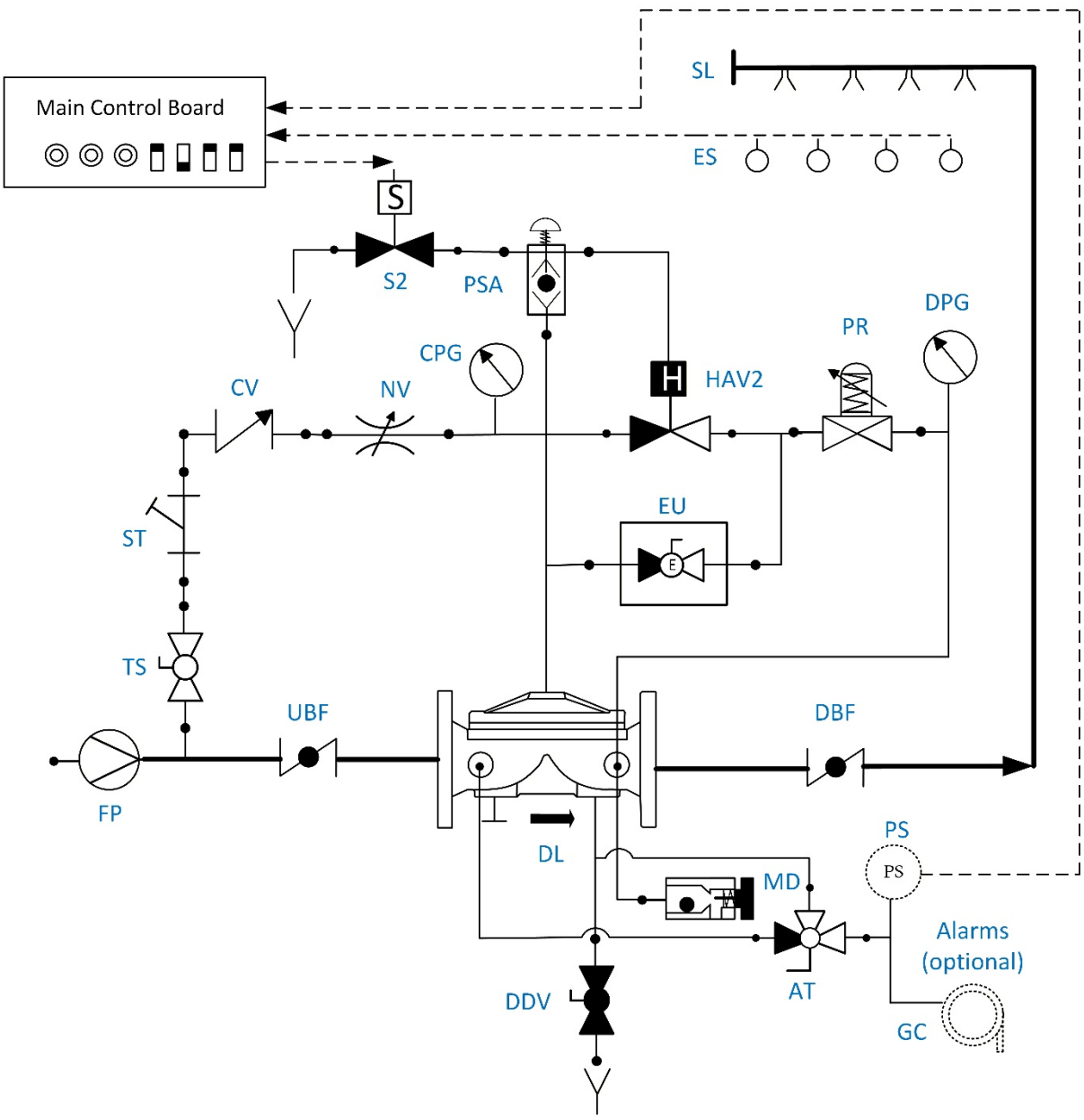
Marking

The FDV valves are marked by a laser engraved, black anodized, 0.8mm (0.031”) thick metal plate, riveted to the valve’s cover.

The marking plate contains the data about (top to bottom):

- *Company name and trademark.*
- *Short description (Italic letters)*
- *Application’s type*: FDV-PE0 - Electric actuated, Local Reset, Pressure Reducing.
- (P/N) *The Application’s part number*: System properties–Valve properties
- *Rated pressure*: 250 psi
- *Equivalent Length: reference table - page UBV.*
- *Serial Number*: Work order number-MM-YY-Number in batch 01-99
- *The UL listing mark & QR code:* EXxxxxx
- *The FM approved mark*
- *The Application’s* diameter in inch: XX”





TS -	Trim supply	UBF -	Upstream Butterfly Valve		Water lines
ST -	Strainer	DBV -	Downstream Butterfly Valve		
AT -	Alarm Test valve	DL -	Deluge Valve		Electrical line
GC -	Gong connection	S2 -	2-way Solenoid valve		
CV -	Check Valve	EU -	Manual Emergency Valve		
DPG -	Downstream pressure gauge	SL -	Sprinkles Line		
CPG -	Control Chamber ressure gauge	DDV -	Downstream Drain Valve		
PSA -	Pressure Supply Arrestor	PS -	Pressure Switch		
MD -	MADV – Manual / Automtic Drain Valve	HAV2 -	Hydraulic actuator valve 2-way		
ES -	Electric Sensors System	PR -	Pressure Reducing Pilot Valve		
FP -	Fire Pump				

RAPHAEL, founded in 1949, is the first Israeli manufacturer of water control valves. RAPHAEL´s research department constantly strives to introduce new and innovative products and solutions for water control systems including water works, fire-protection and irrigation systems.

Waterworks | Fire Protection | Irrigation | Smart Solutions

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